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|-------------------------------|----------------------------|---------------------|--|
| <b>Notice of Allowability</b> | <b>Application No.</b>     | <b>Applicant(s)</b> |  |
|                               | 10/646,522                 | HINSHAW ET AL.      |  |
|                               | Examiner<br>Kimberly Lovel | Art Unit<br>2167    |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1.  This communication is responsive to 4/27/2007.
2.  The allowed claim(s) is/are 6-24 and 30-49.
3.  Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a)  All
  - b)  Some\*
  - c)  None
  1.  Certified copies of the priority documents have been received.
  2.  Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3.  Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4.  A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5.  CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a)  including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1)  hereto or 2)  to Paper No./Mail Date \_\_\_\_\_.
  - (b)  including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6.  DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1.  Notice of References Cited (PTO-892)
2.  Notice of Draftsperson's Patent Drawing Review (PTO-948)
3.  Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4.  Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5.  Notice of Informal Patent Application
6.  Interview Summary (PTO-413),  
Paper No./Mail Date 20070716.
7.  Examiner's Amendment/Comment
8.  Examiner's Statement of Reasons for Allowance
9.  Other \_\_\_\_\_.

**DETAILED ACTION**

1. This communication is responsive to Applicants' Amendment filed 27 April 2007.
2. Claims 6-24 and 30-49 are pending in this application. Claims 1, 11, 17, 30, 35, 41 and 49 are independent. In the Amendment filed 27 April 2007, claims 1-5 and 25-29 are cancelled and claims 6, 8, 9, 11, 13, 15, 17, 19, 20, 21, 23 and 30-49 have been amended.
3. After a thorough search and examination of the present application and in light of prior art made of record and Applicant's Amendments and Remarks filed on 12 October 2006 and 27 April 2007 and the Examiner Amendment made on 18 July 2007, claims 6-24 and 30-49 (renumbered as claim 1-39) are allowed.

**EXAMINER'S AMENDMENT**

4. Authorization for this examiner's amendment, listed below, was given in a telephone interview with David Thibodeau (Reg. No. 31,671) on 18 July 2007. The interview summary is attached.

Please amend claims 6, 30, 35, 41 and 49 as follows:

6. (Currently amended) A method for controlling visibility of data during transaction processing in a multi-version database management system, comprising:

receiving a request for a record stored in a multi-version database from a requesting transaction, the requesting transaction having an associated transaction identifier which uniquely identifies the requesting transaction, a transaction invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction, and an isolation level which describes whether changes made by other transactions are to be visible to the requesting transaction;

wherein the transaction identifier is a numeric value and transaction identifiers are assigned to transactions in increasing numerical order based on a start time of the [[associated]] transaction, such that a first transaction can be determined to start before a second transaction if the transaction identifier associated with the first transaction is numerically less than the transaction identifier associated with the second transaction; and

wherein transaction identifiers associated with transactions that operate in the present have an even numeric value, and transaction identifiers associated with transactions operating "as-of" a specified "as-of" time in the past have an odd numeric value;

wherein the specified "as-of" time is a time in the past that, when used as a argument in an "as-of" query, produces the same results as

would have been produced if a query occurred in the past at the specified "as-of" time;

determining whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier, the transaction invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record;

assigning a Record ID value to the record when the record is first created, the Record ID uniquely distinguishing the record from all other records, and the Record ID preserved across modifications of the record;

finding a transaction identifier for an earliest transaction that started on or after the specified "as-of" time;

creating a new transaction, the new transaction having a start-time equal to the specified "as-of" time, a transaction identifier equal to the transaction identifier for the earliest transaction, minus one, and an isolation level set to Read Committed;

initializing an invisibility list of the new transaction to include the transaction identifiers of all transactions having transaction identifiers less than the transaction identifier for the new transaction and end-times greater than the specified "as-of" time;

removing from the invisibility list of the new transaction, any transactions serialized before transactions visible to the new transaction; and

adding to a visibility list of the new transaction, any transactions with transaction identifiers greater than the transaction identifier of the new transaction, that are serialized before transactions visible to the new transaction.

30. (Currently Amended) A computer readable storage medium containing instructions readable by a computer to configure the computer to [[perform a method for controlling]] control visibility of data during transaction processing in a multi-version database management system comprising:

a requesting transaction requesting a record stored in a multi-version database, comprising:

an associated transaction identifier which uniquely identifies the requesting transaction;

wherein the transaction identifier is a numeric value and transaction identifiers are assigned to transactions in increasing numerical order based on a start time of the [[associated]] transaction, such that a first transaction can be determined to start before a second transaction if the transaction identifier associated with the first transaction is numerically less than the transaction identifier associated with the second transaction;

wherein transaction identifiers associated with transactions that operate in the present have an even numeric value, and transaction identifiers associated with transactions operating "as-of" a specified "as-of" time in the past have an odd numeric value;

wherein the specified "as-of" time is a time in the past that, when used as a argument in an "as-of" query, produces the same results as would have been produced if a query occurred in the past at the specified "as-of" time;

a transaction invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction; and

an isolation level which describes whether changes made by other transactions are to be visible to the requesting transaction;

a transaction manager which receives a request for a record from the requesting transaction and determines whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier, the transaction invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record;

a Record ID manager which assigns a Record ID value to the record when the record is first created, the Record ID uniquely distinguishing the record from all other records, and the Record ID preserved across modifications of the record;

wherein the transaction manager finds a transaction identifier for an earliest transaction that started on or after the specified "as-of" time, creates a new transaction, the new transaction having a start-time equal to the specified "as-of" time, a transaction identifier equal to the transaction identifier for the earliest transaction, minus one, and an isolation level set to Read Committed; and initializes an invisibility list of the new transaction to include the transaction identifiers of all transactions having transaction identifiers less than the transaction identifier for the new transaction and end-times greater than the specified "as-of" time; and

wherein the transaction manager removes from the invisibility list of the new transaction, any transactions serialized before transactions visible to the new

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transaction and adds to a visibility list of the new transaction, any transactions with transaction identifiers greater than the transaction identifier of the new transaction, that are serialized before transactions visible to the new transaction.

35. (Currently Amended) A computer readable storage medium containing instructions readable by a computer to configure the computer to [[perform a method for controlling]] control visibility of data during transaction processing in a multi-version database management system comprising:

a requesting transaction requesting a record stored in a multi-version database comprising:

an associated transaction identifier which uniquely identifies the requesting transaction;

a transaction invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction; and

an isolation level which describes whether changes made by other transactions are to be visible to the requesting transaction;

a transaction manager which receives a request for a record from the requesting transaction and determines whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier, the invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record. wherein to roll back changes of a transaction the transaction manager;

wherein to roll back changes of a transaction the transaction manager:

examines all records created, updated or deleted by the transactions;

stores an aborted transaction identifier in a deleter transaction identifier field of records created by the requesting transaction, the aborted transaction

identifier is less than a numeric value of any other non-NULL transaction identifier;  
stores a deletion descriptor in a list of deleted records the deletion descriptor including the aborted transaction identifier and information uniquely identifying an associated version of the record;  
stores a NULL transaction identifier in the deleter transaction identifier field of records deleted by the requesting transaction;  
removes the deletion descriptor from the list of deleted records, the deletion descriptor including the identifier of the requesting transaction; and writes records with a modified deleter transaction identifier field to a persistent storage device.

41. (Currently Amended) A computer readable storage medium containing instructions readable by a computer to configure the computer to [[perform a method for controlling]] control visibility of data during transaction processing in a multi-version database management system comprising:

a requesting transaction requesting a record stored in a multi-version database comprising:  
an associated transaction identifier which uniquely identifies the requesting transaction;  
a transaction invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction; and

an isolation level which describes whether changes made by other transactions are to be visible to the requesting transaction;

a transaction manager which receives a request for a record from the requesting transaction and determines whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier of the requesting transaction, the invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record;

wherein to retrieve visible records for a requesting transaction operating with Repeatable Read isolation, the transaction manager

reads a record from the database and ensures that the creator transaction identifier of the record is not on the invisibility list of the requesting transaction and has a value less than or equal to the transaction identifier of the requesting transaction,

ensures that a deleter transaction identifier of the record is a NULL transaction identifier, or is greater than the transaction identifier of the requesting transaction, or is both less than the transaction identifier of the requesting transaction and is stored on the invisibility list of the requesting transaction and

ensures that a list of deleted records does not include a description of the record, or that the record was deleted by a transaction whose transaction identifier was greater than the transaction identifier of the

requesting transaction, or that the record was deleted by a transaction whose transaction identifier is both less than the transaction identifier of the requesting transaction and is stored on the invisibility list of the requesting transaction.

49. (Currently Amended) A computer readable storage medium containing instructions readable by a computer to configure the computer to [[perform a method for controlling]] control visibility of data during transaction processing in a multi-version database management system comprising:

means for receiving a request for a record stored in a multi-version database from a requesting transaction, the requesting transaction having an associated transaction identifier which uniquely identifies the requesting transaction, a transaction invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction, and an isolation level which describes whether changes made by other transactions are to be visible to the requesting transaction;

wherein the transaction identifier is a numeric value and transaction identifiers are assigned to transactions in increasing numerical order based on a start time of the [[associated]] transaction, such that a first transaction can be determined to start before a second transaction if the transaction identifier associated with the first transaction is numerically less than the transaction identifier associated with the second transaction;

wherein transaction identifiers associated with transactions that operate in the present have an even numeric value, and transaction identifiers associated with transactions operating "as-of" a specified "as-of" time in the past have an odd numeric value;

wherein the specified "as-of" time is a time in the past that, when used as a argument in an "as-of" query, produces the same results as would have been produced if a query occurred in the past at the specified "as-off" time;

means for determining whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier, the transaction invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record;

means for assigning a Record ID value to the record when the record is first created, the Record ID uniquely distinguishing the record from all other records, and the Record ID preserved across modifications of the record;

means for finding a transaction identifier for an earliest transaction that started on or after the specified "as-of" time;

means for creating a new transaction, the new transaction having a start-time equal to the specified "as-of" time; a transaction identifier equal to the transaction identifier for the earliest transaction, minus one; and an isolation level set to Read Committed;

means for initializing an invisibility list of the new transaction to include the transaction identifiers of all transactions having transaction identifiers less than the transaction identifier for the new transaction and end-times greater than the specified "as-of" time;

means for receiving a request for a record from a requesting transaction, the requesting transaction having an associated transaction identifier which uniquely identifies the transaction, an invisibility list which identifies other transactions whose effects are to be invisible to the requesting transaction, and an isolation level which describes whether changes made by other transactions are to be visible to the transaction; and

means for determining whether the record is visible to the requesting transaction based on the isolation level of the requesting transaction, the transaction identifier, the invisibility list of the requesting transaction, and a creator transaction identifier in the requested record which identifies a transaction that created the record.

***Reasons for Allowance***

5. The following is a statement of reasons for the indication of allowable subject matter:

In the Non-Final Office Action dated 24 January 2007, claims 6, 8, 9, 11, 13, 15, 17, 19, 21, 23, 30-35, 37-45, 47 and 49 were objected to and claims 30-49 were rejected under 35 U.S.C. 101. Claims 6-24 and 30-34 were indicated as allowable if rewritten to overcome the objections and/or rejections. Therefore, as necessitated by the Amendment After Non-Final Rejection dated 27 April 2007 and the Examiner Amendment dated 18 July 2007, the claim objections and the claim rejections have been withdrawn.

The Amendment filed 27 April 2007 further narrowed and clarified the subject matter in each of the independent claims. The combination of the limitations as a whole within the amended independent claims overcome the prior art and therefore are considered allowable subject matter.

An updated search of prior art on EAST database and on domains (NPL-ACM, Google, NPL-IEEE) has been conducted. The prior art searched and investigated in the database and domains does not fairly teach or suggest the teaching of the newly amended claimed subject matter as described above and reflected by the combined elements in independent claims 6, 11, 17, 30, 35, 41 and 49.

Dependent claims 7-10, 12-16, 18-24, 31-34, 36-40 and 42-48, which depend directly or indirectly upon claims 6, 11, 17, 30, 35, 41 and 49, respectively, are also distinct from the prior art for the same reasons.

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6. Any comments considered necessary by applicant must be submitted no later than payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled as "Comments on Statements of Reasons for Allowance."

**Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly Lovel whose telephone number is (571) 272-2750. The examiner can normally be reached on 8:00 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kimberly Lovel  
Examiner  
Art Unit 2167

18 July 2007  
kml

  
JOHN COTTINGHAM  
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*h.s. Lu*